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(Continued on Inside Back Cover)

THE JOURNAL OF
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REMEDIAL READING PRACTICES IN THE SECONDARY SCHOOL*

PAUL WITTY AND WILLIAM BRINK
Northwestern University

Formal instruction in silent reading is usually discontinued by the time the child completes the fifth or sixth grade. It is thought that, at this stage, pupils will have acquired the fundamental skills in silent and oral reading and will have developed attitudes which will lead them to read extensively. The failure of the typical school program to accomplish these objectives is revealed by the decrease in reading among older elementary-school pupils, and by the inadequate skills and needlessly slow reading of many upper elementary- and high-school students.

Even more noticeable and serious, perhaps, are the reading limitations of an unnecessarily large number of pupils who enter the secondary school. One study shows that 2169 out of 7380 eighth-grade graduates read at or below norms for the sixth grade.†

It is generally granted that because of the amount and severity of reading retardation, remedial instruction should be offered for the most seriously retarded pupils. The value of such efforts has been repeatedly demonstrated.‡

Perhaps the clearest proof of the educability of most persons retarded in reading skill is found in the Army's effort to teach the three R's. Among the draftees for World War II there were large numbers of illiterate and non-English-speaking men.

* Acknowledgment is made by the writers of the assistance given by Mr. Jack Childress in the development and administration of the questionnaire and in the preparation of tables used in this article.

† William Kottmeyer. "Improving Reading Instruction in the St. Louis Schools." *Elementary School Journal*, Vol. 45, September 1944, pp. 33–38.

‡ Paul Witty and David Kopel. *Reading and the Educative Process.* Boston: Ginn and Company, 1939.

Special training units were organized to give these men the academic training they needed to become useful soldiers.

By applying tested and established methods, the Army succeeded in developing an amazingly efficient program, one that enabled the average illiterate man to acquire in eight weeks' time the basic academic skills needed in Army life.

The outstanding characteristics of the Army program are found in good remedial reading programs in the public schools. There is the same concern for diagnosing carefully the reading levels and needs of the pupils, for providing useful and stimulating materials, and for offering systematic instruction for a long enough time to assure genuine improvements in literacy.

The amount, nature, and severity of poor reading in the secondary school necessitates the establishment of special classes. The impetus given to learning through membership in a participating group and the gains resulting from strict adherence to an expertly directed program make possible the rehabilitation of large numbers of retarded secondary-school students. Not the least important among the concomitants of such work is the stimulating effect it has in extending and enriching out-of-school experiences—a condition which seems to contribute greatly to the mental hygiene and personality adjustment of the pupils. However, special classes should be looked upon as temporary expedients. And it should be recognized that the provision of remedial programs alone is inadequate to meet the needs of the modern high school. Such an effort should be associated with a broader concern aiming to offer every boy and girl the educational opportunities essential for his full development. The great needs at present seem to be: remedial work for some and developmental reading programs for all pupils.*

In spite of our knowledge of desirable practices to follow with seriously retarded readers, relatively few schools have established programs. As a result, public school administrators frequently refer to reading retardation as the largest obstacle to efficient instruction today.

---

* Paul Witty. Chapter II in *Reading in High School and College.* (W. S. Gray, Editor.) 47th Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press, 1948. See also *Reading in Modern Education* by Paul Witty, Boston: D. C. Heath and Company, 1949.

A STUDY OF REMEDIAL READING PRACTICES

In this paper, it is our purpose to examine the extent to which remedial reading programs are being offered in American high schools. In addition, we shall present facts concerning: the objectives sought, the way the needs of pupils are diagnosed, the materials and methods of instruction employed, and the procedures used in evaluating outcomes.

Data were collected by means of questionnaires and interviews. Letters were addressed to five hundred school systems throughout the United States which had, in 1947, one or more secondary schools enrolling seven hundred or more students. Those schools which had remedial classes were invited to coöperate in the study. Questionnaires were sent to the schools. Replies were received from one hundred nine schools. Ninety-seven schools indicated that remedial reading was carried on in the English department by a regular teacher who gives part of his time to the reading program. Credit in English is usually given for satisfactory completion of the course.

OBJECTIVES OF REMEDIAL CLASSES

The Committee which directed the preparation of the *47th Yearbook of the National Society for the Study of Education* agreed that reading programs of the high school and college should emphasize: (a) skill in reading and studying different types of subject-matter, (b) reading experience to help the student understand himself better and to satisfy with increasing success his personal needs, (c) reading experience to assist him in becoming a more effective citizen in and out of school, and (d) experience that will result in a more enjoyable and profitable pattern of leisure reading.*

The questionnaire listed somewhat similar objectives and requested that respondents indicate whether each objective was stressed very much, somewhat, a little, or not at all. Space was provided for addition of objectives not mentioned. Table I presents some results of the study.

Seventy-five of the schools stated that they emphasized the development of basic habits and skills in reading. Eighty-six stressed greatly the development of interest and enjoyment to be

* Paul Witty. *Reading in High School and College. Op. cit.*, Chapter II.

obtained through guided reading. Sixty-six sought to provide reading experience more nearly in accord with pupils' abilities; and the same number also stressed the development of efficient study habits. Only twenty-three schools emphasized greatly improvement of students' ability to read and study the materials of the various subject areas of the high school. Accordingly, it appears that most of these schools provide classes taught by the teacher of English and aim primarily to improve general skill in reading and to develop interest and pleasure in reading.

TABLE I.—OBJECTIVES OF REMEDIAL READING CLASSES

Objectives	Frequency		
	Stressed Very Much	Stressed Somewhat	Stressed Little or Not at All
To help students in developing basic reading abilities and skills	75	9	
To help students by means of guided reading experiences to develop greater interest and enjoyment in reading	86	19	
To provide for students who are unable to profit from the regular courses experiences more nearly in accord with their abilities	66	23	8
To assist students in the study and reading of materials of instruction of regular high-school classes	23	45	25
To help students to develop efficient and economical study habits	66	28	7

SELECTION AND STUDY OF PUPILS

The two methods utilized most frequently in the selection of pupils are: (1) recommendation of supervisors, administrators,

TABLE II.—METHODS USED IN DIAGNOSIS AND STUDY OF PUPIL NEED

Activity	Frequency		
	Emphasized Greatly	Some Emphasis	Little or No Emphasis
Diagnosis by means of standardized tests	70	32	2
Acquainting pupils with their present reading status	58	44	4
Discovering the nature and extent of reading interests and activities	75	22	4
Stimulating informal discussions of reading interests and activities	46	47	7
Testing for possible visual defect	39	43	14
Testing for possible auditory defect	35	40	21
Obtaining information concerning experiential backgrounds of pupils	38	48	13
Locating instances of lip movements and other symptoms of vocalization in reading	47	48	5
Discovering interests in hobbies, movies, social activities, constructions, collecting, and vacations	51	41	8
Studying emotional characteristics of pupil	50	42	8
Discovering attitudes toward reading	72	28	1

and teachers, and (2) consideration of scores on standardized reading tests. Intelligence tests were employed in half of the schools. It is of interest that in forty-four per cent of the schools the students' requests for help were given primary consideration, while in fifty-three per cent, previous school records were similarly employed. The *Iowa Silent Reading Test* was the most widely used educational achievement test, while the general intelligence test most frequently given was the *Otis Group Test of Mental Ability*. Many of the schools reported a somewhat comprehensive diagnostic program (including study of interests, background of experience, home relationships, and attitude toward reading). Table II reveals the emphasis given to various methods of diagnosing student need.

METHODS AND INSTRUCTIONAL MATERIALS USED

In approximately sixty per cent of the schools, a room library of easy reading material was provided, and direction to reading was given also in the central school library. Only twenty-nine per cent of the schools made a special effort to correlate the work in remedial reading with the endeavor in other subject fields, such as science or social studies. However, there was a rather large number of activities through which these schools sought to improve the students' ability to obtain greater meaning from the printed page. Table III presents these activities and indicates the emphasis given to each of them. It is clear that the major emphasis is accorded skills such as comprehending the central thought of a paragraph, following directions, and obtaining the meaning of the words used in various selections.

Table IV presents the various activities designed to promote rapid silent and oral reading. The frequency with which extensive rapid reading of easy materials is reported as a major emphasis and the high citation of activities designed to help pupils adjust their rates of reading to different kinds of materials are heartening features of this study. They show that these schools are making considerable progress in attacking the problem in remedial reading. However, it should be kept in mind that (as shown in Table I) relatively little attention is being given to reading in the various subject fields.

Wide use of visual and auditory aids was reported by these schools. Several of these aids are designed to help the student

TABLE III.—ACTIVITIES FOR DEVELOPING MEANING THROUGH READING

Activity	Frequency		
	Emphasized Greatly	Some Emphasis	Little or No Emphasis
Aiding pupils in interpreting the meaning of words in reading materials	87	18	0
Providing practice in comprehending central points in paragraphs	86	17	0
Helping pupils in methods of locating information in textbooks	58	42	5
Giving practice in predicting the outcomes of events	27	51	22
Teaching pupils how to follow directions in reading	83	20	1
Reporting to entire class on books read	27	46	25
Writing brief reports of materials read	22	50	22
Teaching pupils how to read the newspaper	26	41	33
Study of formal grammer	6	30	61
Enlarging vocabularies by means of word drills independent of reading materials	28	35	37
Providing practice in letter-writing	20	38	37
Writing short stories	5	23	65
Using practice books in reading	51	39	13
Teaching pupils how to draw conclusions from materials read	61	38	9

TABLE IV.—ACTIVITIES DESIGNED TO PROMOTE RAPID READING

Activity	Frequency		
	Emphasized Greatly	Some Emphasis	Little or No Emphasis
Extensive rapid reading of easy, interesting material	68	27	2
Reading exercises under pressure of time control	36	53	15
Attention to lip movement and excessive vocalization	35	57	10
Keeping a record of pupils' progress in rate of reading	50	41	12
Increasing span of recognition by means of short exposure exercises, flashcards, etc.	25	38	39
Providing training in rapid word recognition	42	30	21
Helping pupils to adjust rate to purpose	62	37	4
Reading and discussing classics	21	33	43

TABLE V.—DEVICES USED TO DIAGNOSE PUPIL NEED OR TO IMPROVE READING SKILLS

Name of Device or Instrument	Frequency
Opthalmograph	4
Metronoscope	4
Tachistoscope	3
Telebinocular	20
Audiometer	26
Flashmeter	1
Buswell Reading Board	2
Opaque projector	2

improve his rate of reading by developing rapid recognition of words and phrases. Other aids are employed for diagnosis of the condition of the pupils' vision and hearing. Table V lists the frequently used aids.

Materials of instruction that stress the visual approach were generally employed. Table VI gives a list of these materials. The use of films in twenty-seven schools represents a distinctly new trend in remedial instruction.

TABLE VI.—VISUAL AND AUDITORY INSTRUCTIONAL AIDS EMPLOYED IN REMEDIAL READING CLASSES

Name of Aid	Frequency
Board work	3
Book jackets	2
Card sets—charts	1
Dolch cards	2
Drawings, pictures, picture books	7
Durrell Word Wheels	1
Films	27
Filmstrips	4
Flash cards	11
Games and contests	1
Maps	1
Oral reading records	1
Radio news and drama	1
Recordings	7
Slides	3
Steroscope	1
Tachistoscope	11
Tape recorder	4

The practice materials most widely used include *Reading Skill-texts* of Charles Merrill Company; *Reading for Meaning* of J. B. Lippincott Company; *Practice Readers* of Webster Publishing Company; *Getting the Meaning* of J. B. Lippincott Company, and *Practice Exercises in Reading* of Teachers College, Columbia University. These practice books were cited by fifteen, thirteen, eleven, ten, and ten schools, respectively. By far the most popular magazine was the *Readers Digest*, reported by forty-

seven schools. *Life* was employed in ten schools. Twenty-six schools indicated that newspaper reading was greatly stressed. It was noticeable from the replies that the remedial program is not usually correlated closely with the broader objectives of the secondary school. Little use was made of related aspects of the language arts, such as writing and discussion techniques, to reinforce and strengthen reading skills. Thus, it appeared that improvement in communication was infrequently the broad goal of the remedial classes.

APPRAISAL OF PROGRESS IN READING

The students' progress was evaluated in the various schools by a number of methods. Table VII presents the procedures

TABLE VII.—METHOD OF EVALUATION

	Frequency		
	Emphasized Very Much	Emphasized Somewhat	Little or No Emphasis
Standardized tests	50	41	6
Records of reading activities kept by students, book report cards, etc.	49	46	6
Oral reports given in class on books and other materials read	29	54	19
Records kept by teacher of reading activities of pupils	55	35	4
Report on reading improvement by teachers of other subjects	12	35	42
Subjective evaluation by teacher	37	44	5
Grades in English	23	42	3

reported. Fifty schools reported a strong emphasis on standard tests; teacher records of reading activity were used similarly by fifty-five, while records kept by the students were emphasized in forty-nine of the schools. It is worth noting that only twelve

schools indicated that improvement of reading in various subject areas was seriously stressed in evaluating gains in reading.

THE RÔLE OF THE TEACHER

Administrators cited the need for more adequately prepared teachers. Concern was expressed again and again regarding the teachers charged with remedial work; for example: "We have no teachers who are specifically trained for this type of class; therefore, the responsibility falls upon a few who are interested and have shown some ability in teaching reading." And again, "We have no specially trained teachers for such courses, and have had to depend upon volunteers who were willing to undertake it."

Of the one hundred twenty-six teachers who were reported to be teaching remedial reading courses in these school systems, only twenty-eight were full-time specialists. The other ninety-eight were regular teachers who volunteered or were drafted for the work. A majority of them had no special preparation for the work. Seventy-five schools used the same teachers as long as the program had been in operation; twenty-one schools 'passed the classes around.' The latter expression, used by one respondent, discloses the feeling among a significant number of teachers that remedial reading classes are undesirable or a special burden. The feeling is further revealed by comments such as: "I have been stuck with these classes for two years now." On the other hand, the vital need for really effective teaching is shown by the comments of many administrators. The following is a typical comment: "We have one teacher doing this special work. She was chosen because of her preparation, wide experience, unusual wisdom and success in working with pupils, and her faith that they can succeed. I would not want such a course unless the 'right teacher' could be found."

CONCLUDING STATEMENT

Although this survey shows that considerable gains are being made in organizing and developing remedial reading classes, much more comprehensive programs need to be undertaken and correlated with developmental reading programs. Unfortunately, little is being done to provide such a correlation. Perhaps a fairly reliable indication of the status of reading in the typical

high school may be obtained from William R. Wood's account entitled "Typical Programs of High School Reading Instruction" in *The North Central Association Quarterly* for April, 1947:*

"From a study of the survey reports, a procedure pattern emerges. The typical school does a good deal of objective testing to determine reading deficiencies. On the basis of the test results and previous scholastic records, pupils are homogeneously grouped. Those who are two or more years retarded are placed in special remedial sections where progress is determined largely by the individual teacher's enthusiasm and special knowledge. Periodically, additional reading tests are given to measure progress, and pupils are transferred to classes at their own grade level if the test results and other factors warrant. The remedial class may be an extra assignment for after-school hours or a replacement of the usual activities hour. Ordinarily, however, it is simply a substitution for the regular English course offered by the school. In a few instances schools which do not have specially trained teachers of reading are fortunate in being able to utilize the services of a private reading clinic.

"No one is satisfied with the typical procedures that have been outlined. The whole problem of the developmental program for average and superior students is not handled in an effective way. The remedial work seldom accomplishes as much as it should. For the ambitious teacher there are unusual opportunities ahead for discovery of new methods, for the production of better materials, and for the creation of an over-all reading instruction plan."

It is evident that there is a need for remedial reading as a temporary expedient in the junior and senior high school. One of the most significant aspects of modern remedial programs is the attention thus made possible to the needs of individuals and small groups. It should be pointed out that, wherever possible, individual guidance and help should be given to the poor reader. In every attempt to offer assistance, there should be a conscientious effort to diagnose carefully the reading levels and needs of the pupils, to provide useful and stimulating materials, and to offer systematic instruction for a long enough time to assure improve-

* William R. Wood. "A Second Attack on Reading Problems in Secondary Schools." Chapter III. "Typical Program of High School Reading Instruction." Report of Subcommittee on Reading. *The North Central Association Quarterly*, Vol. XXI, (1947) pp. 481–483.

ment.* In public schools where such programs have been developed, high-school students almost invariably have been found to improve their ability to read for many important purposes. However, such remedial efforts should be regarded as one part only of a larger program designed to improve reading in all subject areas and to make instruction in reading a responsibility of every teacher.

* William S. Gray. *The Teacher of Reading: A Second Report.* The Thirty-sixth Yearbook of the National Society for the Study of Education, Part I, Bloomington, Illinois: Public School Publishing Company, 1937, Chapters I and III. See also Paul Witty, *Reading in the High School and College*, Chapter II. The Forty-seventh Yearbook of the National Society for the Study of Education, Part II. Chicago: The University of Chicago Press, 1948, pp. 8–26. A more detailed discussion of this topic will be found in: Paul Witty, *Reading in Modern Education*, D. C. Heath and Company, 1949.

INFORMATION AND ATTITUDES TOWARD WORLD AFFAIRS*

BENJAMIN SHIMBERG

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Purdue University

Many educators still cherish the hope that our schools will prove to be effective instruments for developing attitudes of tolerance and understanding for our neighbors at home and abroad. Implicit in our educational scheme is the belief that attitudes will change when students are better informed about their world and their own community.

Numerous investigations have been conducted on the relationship between information and attitudes. The results have been conflicting, and the conclusions tenuous. In most instances, correlational techniques have been used to relate information scores on one hand with attitude scores on the other. Newcomb,[13] Kerr[8] and Cantril and Sherif[2] have reviewed the experimental findings related to this topic. Some investigators have reported positive relationship ranging as high as + .82[5,9,20,22] while others have found only slight relationships.[1,3,7,11,14] One criticism that has been made of these correlational studies is their failure to take into account the reliability of the instruments used to measure both attitudes and information.

Efforts to gain a better understanding of the dynamics which influence the acquisition of information and the development of attitude, have resulted in experiments which point up the importance of such factors as 'climate of opinion'[12] and of 'bookishness.'[10]

Researchers who have been primarily concerned with the measurement of public opinion, have also illuminated the problem by comparing the attitudes of 'well-informed' and 'poorly-informed' individuals. Williams[21] ventured several pertinent generalizations:

1) The chief effect of greater information is to make the well-informed more sensitive to the implications of events or points of view to their own self-interest.

---

* This article is based on a master's thesis, "*The relationship between information and attitudes of high-school students on certain international issues.*" The study was directed by Professor H. H. Remmers and financed, in part, by the Purdue Opinion Poll for Young People.

2) No differences of opinion occur between persons generally well-informed and those generally uninformed when both groups are equally lacking in reliable standards of judgment, where both groups have in common essentially the same standards of judgment, or where wish-fulfillment and personal desire cut across information lines.

3) Information tends to be generalized. Persons who are well-informed in one area tend to have the same opinions as persons well-informed in other areas.

4) The opinions of the well-informed and the uninformed were found to be affected in the same direction by events.

Smith[18] has recently formulated some stimulating hypotheses about the level of information and 'liberalism,' pointing out that information tends to be positively related to 'liberalism' when it is defined in terms of non-economic or inter-class values, and negatively related when defined in terms of approval of certain political-economic proposals.

From the viewpoint of methodology, it is important to note that few investigators have made any effort to control such variables as age, sex, socio-economic status, region or political party preference of the groups studied. It seems reasonable to argue that unless factors such as these are controlled, one cannot be sure whether differences in attitudes may be attributed to differences in information or to the influence of one or more of the uncontrolled variables. Smith[19] recognized this problem and sought to test his ideas using fairly homogeneous subgroups taken from a nationwide sample.

The present investigation was designed to study the differences in the attitudes of well-informed and poorly-informed high-school students on a variety of international problems when certain variables were controlled. Data were collected in September, 1947, by the Purdue Opinion Poll for Young People—a nationwide poll for high-school students directed by Dr. H. H. Remmers. The mechanics of the poll have been described in detail by Remmers[16] and by Gage.[4]

METHOD

The nationwide sample of approximately 10,000 students answered a twenty-item questionnaire administered by teachers to intact groups. The first four questions on the poll were

information questions dealing with atomic energy and the United Nations. These questions were selected from a longer list of factual questions that had been pretested in several Indiana high schools. The difficulty of these questions may be judged from the proportion of students in the total sample that answered each question correctly. The proportion selecting each alternative is given below. The correct alternative is marked with an asterisk.[17]

1) By an act of Congress, who has control over United States Atomic energy at the present time?

The Military Forces	38%
*A Civilian Commission	23%
Private Industry	8%
Don't Know	31%

2) Who is the present director of the United States Atomic Energy Commission?

Bernard Baruch	15%
Leslie Groves	6%
*David Lilienthal	28%
Don't Know	51%

3) Do or do not most scientists think the United States will be able to work out an effective defense against the atomic bomb?

Do	57%
Don't Know	26%
*Do Not	17%

4) Do all nations or only a certain few have the veto power in the United Nations?

All Nations	29%
Don't Know	17%
*A Certain Few	54%

While no data are available as to the validity or reliability of this four-item information test, we may, nevertheless, assert that there is a good likelihood that students answering three or four questions correctly had more information on these topics than students who answered none of the questions or only one question correctly. Smith,[19] who also used four information items

to establish a well-informed and a poorly-informed group has summarized the argument for this type of analysis as follows:

"It cannot, of course, be demonstrated that the people who were well-informed on these four items were generally well-informed. The probability is high, however, that they knew a great deal more about a variety of subjects than did the poorly-informed group. In working with poll data, it is commoner to find consistency than inconsistency in responses to factual questions. Apparently the people who can give three or four correct answers have different interests and habits, as a group, from those who can give only one right response or none. One is probably justified in referring to well-informed subjects as comparatively 'bookish'; and, since both information and degree of formal education correlate with intelligence, they are very likely a more mentally capable group."

We have accordingly adopted this criterion for dividing students into two extreme groups; those answering three or four questions correctly were called 'well-informed' and those answering none of the questions or only one question correctly were called the 'poorly-informed' group.

Since it was the purpose of this study to determine the relationship between information and opinion when other factors were held constant, the following personal information was used to control certain variables:

a) Grade in school; only students in the eleventh and twelfth grades were used. Since age is closely related to school grade, we may assume that age is indirectly controlled to some extent.

b) Sex; both boys and girls were included in the sample.

c) Geographical region; the United States was divided into four regions: East, Midwest, South and the Mountain Pacific states.

d) Urban-Rural residence; students living in the country or in towns under 2500 population were considered rural; those living in larger communities were considered urban.

e) Home environment; a six-item 'house and home' scale was used to estimate socio-economic status. This scale was adapted by Hobson[6] from the most discriminating items on the Kerr-Remmers American Home Scale.

f) Political party preference; students were divided into three groups: Democrats, Republicans, and those favoring 'some other' party or 'no party.'

TABLE 1.—COMPOSITION OF SAMPLE USED IN ANALYSIS

Region	Urban-Rural	Home Environment	Sex	11th and 12th Grades					
				Poorly-informed			Well-informed		
				Dem.	Rep.	Ind.	Dem.	Rep.	Ind.
NE	R	P	M	16	15	4	16	15	4
NE	R	P	F	13	10	3	13	10	3
NE	R	B	M	15	27	4	15	27	4
NE	R	B	F	20	21	7	20	21	7
NE	U	P	M	35	15	10	35	15	10
NE	U	P	F	10	6	4	10	6	4
NE	U	B	M	43	34	17	43	34	17
NE	U	B	F	19	57	22	19	57	22
MW	R	P	M	37	25	9	37	25	9
MW	R	P	F	26	25	8	26	25	8
MW	R	B	M	17	22	7	17	22	7
MW	R	B	F	19	20	4	19	20	4
MW	U	P	M	29	21	14	29	21	14
MW	U	P	F	23	16	8	23	16	8
MW	U	B	M	38	56	18	38	56	18
MW	U	B	F	39	52	18	39	52	18
S	R	P	M	18	4	3	18	4	3
S	R	P	F	19	14	2	19	14	2
S	R	B	M	3	2	1	3	2	1
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MP	R	B	M	3	1	1	3	1	1
MP	R	B	F	0	2	0	0	2	0
MP	U	P	M	2	0	1	2	0	1
MP	U	P	F	2	0	0	2	0	0
MP	U	B	M	6	9	0	6	9	0
MP	U	B	F	5	4	1	5	4	1
Total cases				1129			1129		

KEY to Table I:
NE—Northeast.
MW—Midwest.
S—South.
MP—Mountain Pacific.
R—Rural.
U—Urban.
P—Poorer Home Environment.
B—Better Home Environment.
M—Boy.
F—Girl.
Dem.—Democrat.
Rep.—Republican.
Ind.—Independent.

By means of an IBM sorter, approximately 10,000 ballot cards were classified according to the information items into well-informed, moderately-informed, and poorly-informed groups. The two extreme groups were then subdivided on each of the personal data factors. In this way students could be grouped according to the factors they had in common. We found, for example, forty-two poorly-informed boys from the eleventh or twelfth grade in Eastern rural communities, living in a poorer home environment and favoring the Democratic party. In the well-informed group there were sixteen boys exactly like the others on all characteristics except information. Since only sixteen well-informed boys were available, we selected at random sixteen of the forty-two poorly-informed boys as a matching group. This procedure was followed for each breakdown. In every case, the number of students having a group of characteristics in common was maximized in order to utilize the available data most economically. Table 1 shows the composition of the matched groups.

The final sample, described in Table 1, consisted of 1,129 well-informed and 1,129 poorly-informed students matched on each of the personal data characteristics. For every student with a certain combination of characteristics found in one group, a student with similar characteristics was present in the other group.

While this experimental design manages to hold constant many of the factors which are not usually controlled in analyzing poll data, we must recognize that some factors which may be related to the information variable have not been controlled. For example, we know that intelligence is correlated with information to some extent. Hence, when we refer to the possible influence of the information factor, we really mean information and its correlates (other than those held constant). We should be in error if we attempted to ascribe opinion differences to the influence of information alone. The observed differences may be

ascribed to information only insofar as the various control factors are ruled out as unrelated to the observed variation. We believe that we come closer to measuring the influence of information under such circumstances than we do when we merely hold one factor at a time constant, but the unreliability inherent to our rough control measures and the failure to include certain other characteristics should be kept in mind as limitations on any generalizations we may make.

The responses of well-informed and poorly-informed students to each of the sixteen opinion questions were tabulated by IBM tabulating equipment. The per cent in each group selecting each alternative was computed. The significance of differences between proportions was tested using formula 106 in Peters and Van Voorhis[15] to obtain the standard error of the difference between proportions. In using this formula, the writer recognized that ideally the use of matched groups called for a standard error of a difference which took into account the correlation between these groups. However, since no correlations were available, the shorter formula was used, this formula being a more conservative estimate of the standard error of the difference. We may be reasonably sure that t values would have been even larger and, therefore, even more significant had the correlation between the groups been taken into account; unless, of course, the correlations were negative.

The test of significance applied to these data tests the null hypotheses, i.e., that there is no difference between the two groups. If the value of t is 1.96, we may reject the hypothesis at the ninety-five per cent confidence level; if the t value is 2.58 or greater we may reject the hypothesis at the ninety-nine per cent confidence level.

RESULTS

The sixteen opinion questions used to measure the attitudes of young people towards certain international problems are given below. The proportion of students in the poorly-informed group and in the well-informed group selecting each alternative is given for each question. Differences and t values are also shown in the tables which follow.

The first two questions dealt with the war-expectancy of high-school students.

1) Do you or do you not expect the United States to fight in another war within five years?

	Do	?	Do Not
Poorly-informed	47%	25%	28%
Well-informed	31%	21%	47%
Difference	16%	4%	19%
t	7.7	1.9	9.5

2) Do you or do you not expect the United States to fight in another war within the next twenty-five years?

	Do	?	Do Not
Poorly-informed	70%	23%	7%
Well-informed	67%	22%	11%
Difference	3%	1%	4%
t	1.6	0.5	3.4

In their response to these question, the poorly-informed group appears to be significantly more pessimistic about the chances of averting another war within five years than is the well-informed group. Both groups show a high degree of war pessimism in the second question, but the well-informed group is significantly less pessimistic although the difference is probably too small to be of any practical significance.

The next group of questions concerned problems related to the atomic bomb and world government.

3) Some people have said that all raw materials and plants for making atomic power in all countries, including the United States, should be put under the direct control of an international atomic authority. Do you or do you not approve of such a plan?

	Do	?	Do Not
Poorly-informed	64%	10%	26%
Well-informed	71%	5%	24%
Difference	7%	5%	2%
t	3.5	4.5	0.9

Both well-informed and poorly-informed students clearly favor the proposal to give an international atomic authority control of all raw materials and plants involved in the manufacture of atomic power. The well-informed group is, however, significantly more in favor of the proposal, and fewer of the well-informed students are undecided about the issue.

4) The United States is still making atomic bombs. Do you or do you not approve of this?

	Do	?	Do Not
Poorly-informed	60%	11%	29%
Well-informed	64%	8%	28%
Difference	4%	3%	1%
t	2.2	2.6	0.7

The well-informed students answering this question are found to be significantly more in favor of having the United States continue to manufacture atomic bombs; and the poorly-informed group is significantly more undecided about the issue.

5) If all the nations except Russia could agree on a plan to control atomic energy under the United Nations, would you or would you not favor adopting such a plan without Russia?

	Would	?	Would Not
Poorly-informed	49%	14%	37%
Well-informed	49%	6%	45%
Difference	0%	8%	8%
t	0	5.7	3.5

Here we see that the same proportion of well-informed and poorly-informed students would favor an atomic control plan which did not include Russia. However, poorly-informed students are significantly more undecided on this issue than are well-informed students; and those in the well-informed group are significantly more opposed to an atomic energy control plan which does not provide for Russian participation.

6) Do you or do you not believe that all nations should form a world organization with power to use an international police force against any nation, including the United States, which tried to start a war?

	Do	?	Do Not
Poorly-informed	77%	12%	10%
Well-informed	92%	4%	4%
Difference	15%	8%	6%
t	10.1	7.4	6.1

Results from this question show that well-informed students are significantly more in favor of a strong world organization backed by a world police force. Poorly-informed students, while strongly favoring the proposal, are also much more undecided.

7) Should the development of atomic energy in the United States for peaceful use be carried on by private industry or by the government?

	Private Ind.	?	Gov't.
Poorly-informed	15%	5%	80%
Well-informed	24%	5%	71%
Difference	9%	0%	9%
t	6.6	0.0	6.8

Both well-informed and poorly-informed students are overwhelmingly in favor of government control of atomic energy development, but the well-informed group is less in favor of government control and somewhat more in favor of control by private industry.

8) Some people believe that because of changes in warfare brought about by the atomic bomb, we no longer need a large standing army. Do you agree or disagree?

	Agree	?	Disagree
Poorly-informed	9%	6%	86%
Well-informed	12%	6%	82%
Difference	3%	0%	4%
t	2.6	0	2.6

Well-informed students are slightly more inclined to agree that the atomic bomb has made large standing armies unnecessary. Both groups disagree with the proposition, but more of the well-informed students seem to feel that the atomic bomb has introduced a fundamental change in the methods of warfare.

9) Do you or do you not think that the United Nations should be strengthened to make it a world government with power to control the armed forces of all nations, including those of the United States?

	Do	?	Do Not
Poorly-informed	41%	25%	34%
Well-informed	58%	12%	30%
Difference	17%	13%	4%
t	8.0	8.0	1.9

Well-informed students are significantly more in favor of this proposal than are poorly-informed students. They are also less in doubt about their attitude.

10) Should or should not some military training be given to all able-bodied young men?

	Should	?	Should Not
Poorly-informed	83%	7%	10%
Well-informed	76%	7%	17%
Difference	7%	0%	7%
t	4.0	0.0	4.8

In this question we find that the poorly-informed students are more in favor of universal military training than are the well-informed students.

The last six questions were introduced by the following statement:

People differ about what should be enough to make us go to war against Russia. Some people say we should never go to war again under any circumstances. Others are willing to go to war at the 'drop of a hat.'

The following questions are intended to get an idea of where you stand.

11) Under no circumstances should the United States go to war against the Russians.

	Agree	?	Disagree
Poorly-informed	10%	18%	72%
Well-informed	8%	10%	82%
Difference	2%	8%	10%
t	1.5	5.8	5.9

The well-informed group is more inclined to reject the pacifist position. The poorly-informed group is more undecided about the issue.

12) If the Russians attack United States territory, should we or should we not go to war against them?

	Should	?	Should Not
Poorly-informed	92%	5%	3%
Well-informed	92%	5%	3%
Difference	0%	0%	0%
t	0.6	0.7	0.1

When it comes to defending the United States against attack, both well-informed and poorly-informed students take the same position. No difference is found between the groups.

13) If the Russians get control of any country in Latin America, should or should we not go to war against them?

	Should	?	Should Not
Poorly-informed	33%	41%	26%
Well-informed	42%	28%	30%
Difference	10%	13%	4%
t	4.9	6.5	1.6

The well-informed group seems more willing to fight Russia under the conditions set forth than the poorly-informed group would be. The poorly-informed group is more uncertain about its position. It is possible that the well-informed students see more clearly the implications of Russian expansion into Latin America, whereas the poorly-informed students do not readily relate such expansion with a threat to our own country.

14) If the Russians refuse to withdraw their occupation troops from Germany after the other allies have agreed upon a peace treaty with Germany, should we or should we not drive the Russians out by force?

	Should	?	Should Not
Poorly-informed	56%	29%	15%
Well-informed	52%	25%	23%
Difference	4%	4%	8%
t	2.0	2.1	5.0

The basis for this question was a proposal by former Secretary of State Byrnes. The well-informed group expressed stronger opposition to this idea than did the poorly-informed students and also gave the proposal less positive support. The groups also differ in the degree of uncertainty, the poorly-informed group being less certain which way to go on this issue.

15) If we found out that the Russians were making atomic bombs of their own, should we or should we not go to war against them?

	Should	?	Should Not
Poorly-informed	15%	31%	54%
Well-informed	11%	22%	67%
Difference	4%	9%	13%
t	2.9	4.8	6.3

The well-informed group differs significantly from the poorly-informed group on this question. The former is more opposed to

fighting Russia and fewer students in it are undecided about where they stand.

16) Should we or should we not go to war against the Russians right now?

	Should	?	Should Not
Poorly-informed	5%	16%	79%
Well-informed	4%	9%	87%
Difference	1%	7%	8%
t	1.0	5.1	4.1

Here we see that neither group is inclined to go to war with the Russians 'right now,' but the well-informed students are significantly more opposed to the idea. A higher proportion of the poorly-informed group is undecided on this question.

CONCLUSIONS AND DISCUSSION

The results of this investigation show clearly that young people who are similar in many ways, but who differ in the amount of information they have about current affairs, express significantly different opinions about international issues.

Of the sixteen opinion questions analyzed in this study, significant differences were found between the two information groups on all but one question. The well-informed group, by its answers to the questions, may be characterized as more optimistic, more internationally-minded, more aware of the implications of events, and less given to emotional solutions to international problems. This group is, at the same time, more in favor of private enterprise and quite 'hard boiled' about certain issues.

Only on the question of going to war with Russia if United States territory were attacked, there was no difference in the attitudes of well-informed and poorly-informed students. Here is evidence that regardless of the amount of information they may have, American youth respond in the same way when national security is threatened. This confirms the observation made by Williams[21] that "no differences of opinion occur between persons generally well-informed and those generally uninformed when both groups . . . have in common essentially the same standards of judgment."

A comparison of the two groups on the questions dealing with

the likelihood of war shows the well-informed group consistently more optimistic. This characteristic of well-informed persons has also been mentioned previously by Williams.[21]

On the questions dealing with control of atomic energy and the establishment of a world government with police powers, the well-informed group was significantly more in favor of the proposals that indicate a belief in internationism. This agrees with Smith's[18] conclusion which was discussed earlier.

With respect to the proposed plan to control atomic energy without Russian participation, the well-informed group showed its skepticism of the idea by recording a significantly higher unfavorable vote than did the poorly-informed group. This suggests that the well-informed students may be more aware of the pitfalls of such a proposal. This group also seemed to take a somewhat 'hard boiled' view of the question of continued American manufacture of atomic bombs. They registered higher approval and less uncertainty to the statement that the United States was still making atomic bombs.

On the issue of public *versus* private development of atomic energy for peaceful use, the well-informed group was much more favorable toward private industry than the poorly-informed group. This ties in with Smith's observation (reported earlier) that on politico-economic matters, the well-informed group tends to be more conservative, while the less well-informed espouse the more 'liberal' solutions, including such proposals as government control of key industries.

The question of universal military training found both groups overwhelmingly in favor of the proposal. However, the endorsement of the well-informed group was significantly less than that of the poorly-informed one. Well-informed students were also in greater agreement with the statement that changes in methods of warfare had made large standing armies obsolete. These differences suggest that the well-informed group is not being as readily stampeded into endorsing universal military training.

The six questions concerning war with Russia bring out some interesting differences in the reactions of the two groups to hypothetical situations. The well-informed group seems to be less pacifistic. A significantly higher proportion of this group reject the proposal that "under no circumstances should the United States go to war against the Russians."

The poorly-informed group appears eager to fight Russia at the 'drop of a hat.' They are more in favor of driving the Russians out of Germany by force, and more in favor of going to war if the Russians begin stockpiling atomic bombs. However, when it comes to fighting the Russians if they should get control of a Latin American country, the well-informed group is more in favor of war than are the poorly-informed students.

From these questions we get the impression that the poorly-informed group tends to take the more emotionalized solution to complex problems, showing a readiness to resort to force rather than continuing to seek peaceful solutions. On the other hand, the poorly-informed group fails to see the implications of certain events. The shadow of Russian power in Latin America seems to have been recognized as a threat to American security by more well-informed students, while poorly-informed ones apparently do not so frequently comprehend this as a threat.

One other important characteristic of the poorly-informed group should not be overlooked. This group was less capable of making up its mind on the issues presented. On ten of the sixteen questions, there were significant differences between the well-informed and poorly-informed students on the 'undecided' response. This is a clear indication of the importance of information in reaching decisions. In the absence of information, many students in the poorly-informed group either could not express an opinion or they had to fall back on the more emotionalized or stereotyped responses. This, as we have seen, was particularly evident on the questions dealing with Russia.

IMPLICATIONS FOR EDUCATION

The consistent difference found in the attitudes of the well-informed and poorly-informed students suggests that information may be a potent tool in shaping the attitudes of young people.

The well-informed group tended to have the attitudes to which most educators would probably subscribe. We have no evidence in this study to indicate that information alone is responsible for these attitudes. The acquisition of information is related to such factors as 'climate of opinion,' availability of information, usefulness of information, and interest in the topics under investigation. We cannot be sure why some students acquire information and why some do not. Perhaps the same factors which encourage

students to acquire information also predispose them to the attitudes they adopt. However, the use of matched groups should have eliminated, to some extent, this type of variation. If an influence like interest is the predisposing factor, we may still ask—which comes first, information or interest? This type of controversy lies outside the scope of the present paper.

The fact that information is related to attitudes should serve as a stimulus for teachers to devise ways to establish conditions conducive to the acquisition of information about international affairs. All students may not develop the desired attitudes, but the indications are that as students learn more about the problems, they gain a better understanding of how such remote matters as atomic control or aggression in South America, are related to their own security and self interest. It is reasonable to suggest that an understanding of the events, and the development of critical attitudes toward the more emotionalized and stereotyped solutions frequently gives rise to the attitudes that educators are trying to promote as a foundation for world citizenship.

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SEPARATION OF SEX GROUPS IN TEST REPORTING

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The literature on sex differences in learning has long ago demonstrated that boys and girls acquire knowledge and skills selectively. One need not attribute these differences to biological predispositions, since our culture provides differential experience to the two sexes, and consequently differential opportunity and motivation for learning in specific areas. The present paper deals not with the theory of sex differences, but with the need for recognizing them in test construction, standardization and interpretation.

Most well-conceived research in the intelligence testing field has revealed little or no difference between the sexes. This may be a reflection of true equality between girls and boys. It is equally attributable to the way in which the tests have been constructed. In the 1937 revision of the Stanford-Binet, for example, the individual tasks were so selected as to result in equality of performance by the two sexes. Those tasks which resulted in an imbalance favoring one sex or the other were eliminated. The wholly defensible assumption was made that "test batteries of extensive scope and varied content as a rule yield only small sex differences in total scores, and that when individual test items do show large sex differences these can often be accounted for in terms of known differences in environment and training."* In this case, it is recognized that the assumption of native equality in ability is being made, and the tasks are deliberately chosen to fulfill that assumption. This is not the same as combining total scores into a single distribution without prior selection and investigation of the items with respect to sex differences. It is not sufficient justification for other constructors of intelligence tests to make the tacit assumption of equality between sexes without investigating sex differences on either the individual items or on total score. If real differences on total

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* McNemar, Quinn, *The Revision of The Stanford-Binet Scale*, An Analysis of the Standardization Data, Houghton Mifflin Company, 1942, p. 43.

score do appear, there is an obligation to report separate sex distributions.

Achievement test results have for many years demonstrated selective superiority of boys and girls. Boys are generally superior in arithmetic, science and history; girls usually excel in reading, languages and the arts. Yet, although this is common knowledge, achievement tests in these and other subjects rarely present sex-differentiated norms. Even the best-standardized tests, such as the Stanford and Metropolitan batteries, are accompanied by combined norms. Data from the recent standardization of the Metropolitan Achievement Tests have been made available to the writer.* These data show that seventh-grade girls score as well on the English tests as eighth-grade boys. On the other hand, eighth-grade girls score little better on the History and Civics test, and no better on the Geography test than seventh-grade boys.

Where such sex differences exist, two kinds of justification might be advanced for ignoring them. It might be proposed that the norms are intended to indicate how much of a given subject-matter students should have learned at specified age and grade levels, and the goals should be the same for boys and girls. If this is the operating principle, then norms should not be derived statistically at all. Norms as goals should be decided by educational philosophers and administrators without reference to test score distributions. Since manuals stress that their norms are descriptions of what exists, rather than what should be, this argument must be rejected.

The second approach to justifying combined sex norms is that a given student competes with boys and girls in his studies, and should therefore be compared with both. The principle of comparing a student with his competition must be accepted as valid; but is that competition primarily with the combined sex group? Boys and girls differ considerably in their ability to spell. Spelling is the best predictor uncovered thus far of success in stenography. The proportion of boys in any stenography class is ordinarily very small indeed. Similarly, some girls may choose mechanical curricula, but they will be few and far between. And

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* The writer is indebted to World Book Co., publishers of the Metropolitan Achievement Tests, for these data.

those who do will find their competition almost entirely male. Additional examples of single sex specialization could be added in large numbers: from educational spheres when students go to non-co-educational institutions as well as professional and vocational areas where one or the other sex is largely predominant.

Achievement tests are used for prediction of vocational success, but aptitude tests are even more widely used for this purpose. The data presented in Table I were prepared from distributions of scores on the Differential Aptitude Tests, a series including tests of Verbal Reasoning, Numerical Ability, Abstract Reasoning, Space Relations, Mechanical Reasoning, Clerical Speed and Accuracy, Spelling and Sentences. The Interpretive Manual of the Differential Aptitude Tests presents norms separately for boys and girls for each grade from VIII through XII. For purposes of this study, one grade only—the tenth—was selected as a demonstration of the effect of ignoring sex differences.

Boys' and girls' scores on each of the eight tests were thrown together into single combined distributions, and the scores which fell at designated percentile points were found. These scores were then compared with the scores and percentile equivalents which appear in the Manual. These are the data which are shown in Table I. The table is read as follows: to obtain a percentile rank of 50 on the boys' norms of the Verbal Reasoning Test, a tenth-grade boy would need a score of 23; a girl would need a score of 22 to reach the 50th percentile on girls' norms; and either of them would need a score of 22 to reach the 50th percentile on norms based on a combined distribution.

The Verbal and Numerical percentile equivalents do not indicate the presence of sex differences on these tests. On the Abstract Reasoning Test, there are small differences in favor of the boys; but, if only the combined distribution were used for counseling, the judgments would not vary from those based on single sex scores. A boy whose score of 34 placed him at the 70th percentile on the boys' distribution would be found at the 75th percentile on the combined scale.

The Space Relations Test, however, begins to show more sizable sex differences. The percentile equivalent differs by about ten points, depending on whether the single sex or combined distribution is used. A boy whose score of 56 placed him at the 60th percentile for boys would be at about the 70th per-

TABLE I.—SCORE EQUIVALENTS OF DESIGNATED PERCENTILES FOR BOYS AND GIRLS SEPARATELY AND COMBINED—TENTH GRADE

Differential Aptitude Tests. Form A

Percentile	Verbal Score			Num. Score			Abs. Score			Space Score			Percentile
	B	G	T	B	G	T	B	G	T	B	G	T	
95	39	39	39	33	31	33	42	41	41	83	73	79	95
90	35	35	35	30	29	30	39	39	39	76	67	73	90
80	31	30	31	27	24	26	36	35	35	69	57	64	80
75	30	29	29	25	23	24	35	33	34	65	53	60	75
70	28	27	28	24	22	23	34	32	33	63	49	57	70
60	25	24	25	21	19	20	31	29	30	56	41	48	60
50	23	22	22	18	17	18	29	26	28	47	35	40	50
40	20	19	19	16	15	15	26	23	25	37	28	32	40
30	17	16	17	14	13	13	23	19	21	26	22	24	30
25	16	15	16	12	11	12	21	16	19	22	19	20	25
20	14	14	14	11	10	11	19	13	16	18	15	17	20
10	11	11	11	7	7	7	9	4	7	10	10	10	10
5	8	8	8	4	4	4	2	1	1	4	5	5	5

Percentile	Mech. Reas. Score			Cler. Score			Spell. Score			Sent. Score			Percentile
	B	G	T	B	G	T	B	G	T	B	G	T	
95	57	41	54	71	83	80	85	90	88	57	64	63	95
90	54	37	50	65	75	73	78	86	84	51	59	57	90
80	50	32	44	60	69	65	66	78	74	44	53	49	80
75	48	31	41	58	67	63	62	75	71	42	50	46	75
70	46	29	39	56	65	61	56	72	67	40	47	44	70
60	43	26	34	53	62	58	49	66	60	36	43	40	60
50	40	23	30	51	59	55	41	60	52	32	39	36	50
40	37	20	26	49	56	53	34	52	44	28	36	32	40
30	33	17	23	46	53	50	25	45	35	23	30	27	30
25	31	16	20	45	52	48	21	40	30	21	28	25	25
20	28	14	18	43	50	46	16	36	24	18	25	22	20
10	21	10	13	38	45	42	5	20	11	11	19	15	10
5	15	5	8	34	40	37	2	7	3	3	12	8	5

centile on the combined distribution. The most dramatic differences favoring the boys appear on the Mechanical Reasoning Test. Counseling would be very different if one had only the combined distribution available rather than the ones based on single sex scores. For example, a boy with a Mechanical Reasoning score of 40 would be close to the 75th percentile on a combined distribution scale. With only that information, the counselor would be impelled to consider him as having enough ability to compete favorably in a curriculum or occupation requiring mechanical understanding. If he entered such a curriculum or occupation, however, his competition would be almost entirely male. Compared with boys only, his score of 40 leaves him at the 50th percentile, a ranking not at all superior.

The differences on the Clerical, Spelling and Sentences tests all definitely favor the girls. A girl scoring 53 on the Clerical Test would be at the 40th percentile on a combined distribution, but at only the 30th percentile on a girls' scale. If she scored 52 on the Spelling Test she would be at the 50th percentile on a combined scale, and the 40th percentile of a girls' distribution. A girl's score of 36 on the Sentences Test is at the 50th percentile on a combined distribution, and at the 40th percentile of a girls' scale.

It is clear from these data that to the extent that competition in any curriculum or vocation comes preponderantly from a single sex, separate sex norms are needed for test score interpretation. Thus, a girl who intends entering a mechanical field should be considered against boys' norms. If her chances of success are to be promising, her score must be extremely good for her sex; if she is to equal the 75th percentile for boys, she must be at the 99th percentile for girls.

With respect to reliability, the writer has not seen fit to make as complete an analysis as has been made for the discussion of norms. Table III of the Differential Aptitude Test Manual presents reliability coefficients for each sex for each grade from the eighth through the twelfth inclusive. This table shows sex differences in test reliability in most instances, but not many of these differences are practically important; in fact, on the same test the higher coefficient may be found for boys in one grade and for girls in another grade. Some important differences do appear, however. On the Clerical Test in the eighth grade both

Forms A and B show a difference of .10 in reliability (.77 boys and .87 girls). In Mechanical Reasoning, the reliability coefficients for boys are consistently higher (by .12 to .17) than the girls. The stability of scores on these tests must be evaluated quite differently for the two sexes.

That validity coefficients will show sex differences follows naturally from the previous considerations. Since the reliability of a test acts as a ceiling on validity, sex variation in reliability must be reflected in validity variation. Furthermore, it has been noted that boys and girls frequently enter different curricula and occupations. Since there is no such thing as 'the' validity of a test—since validity is specific to the criterion—the very fact of differences in choice of courses and jobs makes separate validity coefficients mandatory. A third consideration may be that boys and girls use different abilities to achieve success. As one example of sex differences in validity, we may cite the following coefficients between twelfth-grade English marks and Differential Aptitude Test scores in a Hamilton, Ohio, high school:

Differential Aptitude Test

	Boys (N = 119)	Girls (N = 146)
Verbal	.61	.58
Numerical	.49	.59
Abstract	.32	.46
Space	.22	.33
Mechanical	.06	.38
Clerical	.14	.20
Spelling	.60	.40
Sentences	.66	.69

Several explanations of these differences might be proposed. The point being made here is simply that the differences do exist, and warrant reporting.

It might well be suggested that if we agree to the desirability of having separate sex norms, we ought also to agree to separate vocational goal norms, separate curricular norms, separate city norms—in fact, separate norms for every conceivable kind of group with which those who take tests are likely to compete. This sounds like an ambitious undertaking—probably too ambitious to be practically possible. The writer agrees that it is

perhaps over-ambitious. He, nevertheless, affirms that considerable progress toward the goal is possible; that progress toward the goal is highly desirable; and that, by wise selection of the most important areas needing differential reporting, we can promptly and notably increase the usefulness of tests for selection and guidance purposes alike.

THE RELATIONSHIP BETWEEN READING ABILITY AND INTELLIGENCE AMONG UNIVERSITY FRESHMEN

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It has long been recognized that a close relationship exists between reading ability and intelligence. Binet used ability-to-read as an item in his earliest attempts to measure mentality. It is still retained in the latest revision of the Binet test, and continues to be a major factor in most of the aptitude tests used in schools and colleges.

Learning-to-read, like learning to do anything else, has its limits set by inherent patterns of mental development, but it does not follow that reading ability and intelligence are synonymous. While it takes definite degrees of mental maturity to develop reading proficiency, there are many individuals of superior and normal intelligence who have reading difficulties. The large percentage of poor readers found in our high schools and colleges indicates this condition, and the clinical diagnosis of reading difficulties attests the fact that intelligence and reading skills do not always go hand-in-hand.

The success of reading programs in high schools and colleges illustrates that reading efficiency is not necessarily a measure of intelligence. For example, Kilby[5] reports that college freshmen who receive remedial reading instruction earn significantly higher final grade averages than the untrained students of equal aptitude rating and slightly higher initial reading status. He also found that no level of aptitude could be established as having improved scholastically more than another in consequence of reading instruction; however, all levels of aptitude and all levels of previous achievement were able to benefit from remedial reading. It is the common observation of those experienced in clinical reading, and reading in the upper-grade levels, that low mentality is not a cause of the majority of reading difficulties. That most of the children who are able to go to school by themselves can be taught to read, if teaching methods are scientifically adapted to their needs, is further evidence in support of

this viewpoint. The rapid growth of reading instruction in high schools, colleges and universities during the past ten years indicates the tendency for educators to recognize that reading proficiency depends upon many factors in addition to intelligence. As Kilby has pointed out, the university senior student finds that the difference between an 'A' and a 'C' grade is less dependent upon scholastic aptitude, which is relatively homogeneous at the senior level, than upon reading efficiency. Humber[4] expresses a similar opinion.

Very few people ever develop reading skills anywhere near commensurate with their mental capacities. Probably the mentally dull student reads nearer his mental level than the superior student. The most seriously retarded readers in our schools and colleges are the mentally superior students. Skill in reading continues to develop throughout life; reading experiences, even without specific reading instruction, improve proficiency. Anderson and Morse,[1] studying the reading of veterans, report that reading scores continuously increase from freshman to senior year as a consequence of academic and general reading experiences. The degree to which an individual can develop reading skill and the degree to which he does develop it are two different things. Using ability-to-read as a major factor in determining intelligence is a dangerous educational policy. It presupposes uniform reading instruction, and uniform reading experiences, interests and motivation. Nevertheless, aptitude tests depending heavily upon reading ability continue to be a determining factor in guidance, admissions, and instructional policies in most of our institutions of higher learning.

The studies of Williamson,[9] Humber,[4] and Peixotto[6] suggest that reading efficiency may be a significant variable in the low predictive values of the ACE and other college aptitude tests. Peixotto reports that aptitude scores on the Scholastic Aptitude Test can be used as a screening device for students needing remedial reading. Sartin[7] reports that ability to do paragraph reading, as measured on the Potts-Bennett Tests for Nursing Aptitude, is more closely related to success than the Army Alpha scores. Wheeler[8] points out that the ACE measures linguistic ability rather than general aptitudes.

It is the purpose of this investigation to show the relationship that exists between the reading proficiency and intelligence

ratings of University of Miami freshmen. Data for the study were taken from the results of placement tests on file at the University of Miami Guidance Center, where the placement and guidance program of all entering students is handled. The American Council on Education (ACE) psychological ratings and reading scores of 1681 freshmen enrolled November, 1946, and February, 1947, are compared according to various curricula and as a total group. The total reading scores made by these freshmen is studied in relation to the linguistic (L), quantitative (Q), and total (gross) scores on the ACE Psychological Examination. This aptitude test is so constructed that the linguistic value is heavily weighted in calculating the total score.* This weighting is done on the assumption that language factors represent scholarship better than the quantitative attributes of intelligence, an assumption that is undergoing serious questioning at the present time.

Table I shows the total reading scores made on the ACE test by University of Miami freshmen enrolled in the liberal arts, science, business administration, and education schools. Comparisons are made with the ACE norms for entering freshmen. The liberal arts students rank highest in reading skill, and the education non-academic majors rank lowest. The liberal arts students fall 3.23 (critical ratio, 9.22) points below the norms for liberal arts entering freshmen. Science and business administration students, compared with the pre-professional norms for entering freshmen, fall 10.72 and 11.76 points, respectively, below the test standards. The education students, compared with the norms for teachers colleges, fall below 3.67 (critical ratio 5.19) points. This difference is attributable mainly to the non-academic majors (physical education students) in the school of education. The non-academic majors fall 4.99 (critical ratio, 5.91) below teachers college norms, while no significant difference is shown between the academic majors and teachers college norms (difference 1.75 with critical ratio of 1.91). The reading ability of the total group of students appears to be 4.35 points below the average for the norms.

In a previous study† it was established that these same University of Miami freshmen scored as high on general intelligence,

* See Dunlap.[3]

† See Wheeler.[8]

measured by the ACE, as freshmen found in other four-year colleges. In view of this fact, it appears evident that these students show a retardation in reading development. Among the liberal arts and education students this reading retardation may not be large enough to be of any great practical importance. In the case of the science and business schools the retardation is sufficient to warrant special instructional attention. For prac-

TABLE I.—MEAN ACE READING SCORES FOR UNIVERSITY OF MIAMI FRESHMEN COMPARED WITH THE NORMS FOR ENTERING FRESHMEN

Students	No. Cases	ACE Total Reading Scores		Variation from Norm	CR
		Mean	SD		
1. Liberal Arts	517	57.37	8.45	3.23	9.22
2. Science	507	55.98	8.80	10.72*	26.80
3. Business	544	54.94	7.29	11.76*	32.90
4. Education (total)	113	51.43	7.47	3.67†	5.19
(a) academic majors	37	53.35	5.54	1.75	1.91
(b) non-academic	74	50.11	7.23	4.99	5.91
5. Total, all students	1681	55.78	5.48	4.35‡	31.75

* Pre-professional college norm

† Norm for teachers colleges

‡ Average of liberal arts, pre-professional and teachers college norms

tical purposes it would seem that students in all the curricula fields need equally well-developed reading skills in order to derive full benefit from both university courses and after-college situations. In that sense comparisons with the ACE norms appear ambiguous. It seems quite as important for schoolteachers to be able to read as well as scientists, doctors, lawyers and business administrators. Thus the purpose of reading instruction becomes a matter of developing reading ability up to the mental levels of the students rather than up to the norms.

Since approximately half of the students in the University of Miami come from widely distributed areas outside the state of Florida, this retardation does not appear to be due entirely to local preparatory instruction. Rather the trend suggests that, due to the liberal admission policies of a university where students are not selected primarily on the basis of College Board or similar examinations, the university may attract a greater number of students who are more or less handicapped by reading difficulties.

Table II shows the differences in mean reading scores and psychological ratings of freshmen students in the various curricula. No significant difference exists between the reading skills of science and business students. While small significant statistical differences appear in reading between liberal arts students and those in the business and science curricula, the actual differences are probably too small to be of much practical importance. The reading ability of students in the education school falls 3.51 points (critical ratio, 2.92) below business students; 4.55 points (critical ratio, 5.65) below science students; and 5.94 points (critical ratio, 7.48) below liberal arts students. In breaking down the education students into the academic and non-academic majors, the non-academic majors (physical education students) fall 7.26 points (critical ratio, 7.97) below liberal arts students, and the academic majors fall 4.02 points (critical ratio, 4.41).

A study of these reading scores in relation to the psychological ratings reveals that the ranking of the schools on the basis of reading ability could have been done equally as well by using the linguistic scores of the psychological test. Conversely, the linguistic intelligence, or intelligence as measured by the verbal items in the test, could have been as well determined by the reading test as by the intelligence test. However, the same relationship does not appear to exist between reading scores and quantitative intelligence. Because of the method of weighting the linguistic items in obtaining the gross psychological scores, the latter correspond nearer to the linguistic and reading scores than to the quantitative scores. No significant difference exists in quantitative intelligence between the academic and non-academic majors in education.*

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* See Wheeler.[8]

Table III gives correlations between reading and psychological scores which substantiate the relationship trends indicated in Table II. A high degree of relationship exists between reading and linguistic scores in all the curricular fields, as shown by the correlations ranging from .65 ± .026 for science students to

TABLE II.—DIFFERENCES IN THE ACE READING SCORES AND PSYCHOLOGICAL RATINGS OF STUDENTS ENROLLED IN LIBERAL ARTS, BUSINESS ADMINISTRATION, SCIENCE, AND EDUCATION SCHOOLS AT THE UNIVERSITY OF MIAMI.

Comparisons of Schools	Total Reading Scores		Psychological Scores				Gross	
			Linguistic		Quantitative			
	Mean Difference	CR	Mean Difference	CR	Mean Difference	CR	Mean Difference	CR
1. Liberal Arts and Education	5.94	7.48	13.54	7.87	5.52	4.37	18.95	7.49
2. Science and Education	4.55	5.65	11.96	7.07	7.51	5.96	20.92	7.97
3. Business and Education	3.51	2.92	10.84	6.44	6.37	5.05	17.25	7.62
4. Liberal Arts and Business	2.43	3.50	2.70	2.89	0.85	1.28	1.70	1.17
5. Liberal Arts and Science	1.39	2.56	1.58	1.69	1.99	2.95	1.97	1.29
6. Science and Business	1.04	2.07	1.12	1.28	1.44	1.65	3.67	2.62
7. Liberal Arts and Physical Education	7.26	7.97	16.62	13.40	7.16	5.00	22.68	7.20
8. Liberal Arts and Education Academic Majors	4.02	4.41	8.25	2.50	7.16	5.04	9.89	4.00

.76 ± .069 for the academic majors in education. A correspondingly marked relationship appears between gross psychological and reading scores. The correlations for all freshmen, disregarding curricula choice, are .70 ± .012 for reading and linguistic scores and .71 ± .012 for gross psychological ratings and read-

ing scores. The relationship between reading and quantitative scores for the total student group is shown to be low, r = .36 ± .021. All the correlations shown for the academic and non-academic education majors, appearing high in relation to the total and curricula groups, should be cautiously interpreted in view of the small number of cases involved.

TABLE III.—READING SCORES CORRELATED WITH THE LINGUISTIC, QUANTITATIVE, AND GROSS PSYCHOLOGICAL SCORES OF UNIVERSITY FRESHMEN.

Students	Linguistic and Reading		Quantitative and Reading		Gross Psychological and Reading	
	r	S.E.	r	S.E.	r	S.E.
1. Liberal Arts	.69	.023	.42	.036	.68	.024
2. Business	.74	.019	.30	.040	.61	.025
3. Science	.65	.026	.38	.052	.79	.016
4. Education	.72	.045	.45	.085	.63	.057
(a) academic majors	.76	.069	.58	.109	.75	.073
(b) non-academic majors	.72	.006	.57	.009	.59	.075
5. Total of all students	.70	.012	.36	.021	.71	.012

As we should expect, a relationship does exist between reading skill and intelligence as measured by quantitative factors, but that relationship is very low in comparison to the relationship of reading to the linguistic phases of the psychological test. It might seem from the high correlations between reading and linguistic scores that reading ability is a good index of linguistic intelligence. However, it is well established (1) that reading skills can be improved by instruction and practice at all but the lowest levels of intelligence, (2) that few people read up to their mental potentialities or mental levels, and (3) that many factors of instruction, experience, interests, etc., influence reading development. Since learning-to-read is thus known to be a highly

variable factor depending upon the vicissitudes of schooling, purposes, ambitions, personalities and opportunities, it seems highly probable that the linguistic phases of intelligence scales do not test native mental ability to the degree expected.

If quantitative scores are fairly valid measures of intelligence, then it appears from these correlations that the ACE linguistic psychological examination is largely a reading test. The fact that reading ability can be markedly improved by instruction precludes the possibility that all of this reading-linguistic relationship is due to the existence of a special mental factor called 'linguistic ability.' The amount of potential linguistic ability, as such, can be estimated only after determining the amount of reading improvement that results from special instruction.

SUMMARY

The ACE psychological ratings and reading scores of 1681 university freshmen are compared according to various curricula and as a total group. The total reading scores are studied in relation to the L, Q, and Gross scores of the psychological test. A study of the data reveals the following:

1) Liberal arts, business administration and science students made higher reading scores than education students. The physical education majors scored the lowest.

2) The total group of students appears to be somewhat retarded in reading in relation to intelligence and reading test norms. The pre-professional students of the science and business curricula appear the most seriously retarded when compared with the reading norms.

3) A high degree of relationship is found between reading skill and linguistic psychological scores, $r = .70$.

4) A low degree of relationship is found between reading ability and quantitative scores, $r = .36$.

5) The correlation of reading test results with gross scores shows a high relationship, $r = .71$.

6) Since reading skill is known to be a highly variable factor by virtue of its susceptibility to instruction at all but the lowest levels of intelligence, it appears that the ACE Psychological Examination is materially influenced by reading efficiency. Special consideration should be given this factor in interpretation and use of the test results.

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A STUDY OF THE RELATIONSHIPS BETWEEN THURSTONE PRIMARY MENTAL ABILITIES AND HIGH SCHOOL ACHIEVEMENT*

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STATEMENT OF THE PROBLEM

The problem of what the structure, or nature, of intelligence may be is fundamental to psychology and education. Thurstone has recently established the hypothesis that intelligence consists of several primary mental abilities.[10] His experimental work has yielded evidence of certain independent or primary mental abilities to which he has ascribed the following names: Verbal-Meaning, Word-Fluency, Reasoning, Memory, Number, and Space. This paper reports an investigation of the relationship between these various abilities, as measured by *The Chicago Tests of Primary Mental Abilities,* and achievement in various academic fields. Specifically, it reports the obtained relationship between each of these abilities and the subtests of the *Iowa Tests of Educational Development;* performance on Rate of (reader's) Comprehension and Level of (reader's) Comprehension tests of the *Cooperative English Test: C1,* and certain other measures of reading. Also, the paper reports an investigation of the combinations and weightings of the various mental abilities that give best prediction of achievement, as here measured, and the efficacy with which the best combinations predict achievement. The investigation was conducted with ninth-grade students.

RELATED RESEARCH

The greater part of the literature dealing with prediction of general achievement is at the college level. One of the most recent reviews is that written by Borow.[2] The following statement of his is pertinent:

"Surveys of numerous studies in which intelligence test scores were used have shown that the average intelligence test possesses

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* A summary of a dissertation prepared under the direction of Professor James B. Stroud and submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at the State University of Iowa.

a correlation of approximately .45 with grades in college. . . . The most efficacious combination of intelligence test, content examination and high-school record rarely produces a multiple correlation exceeding .75."

Certain studies at the college level may be said to parallel the present study. They report correlations between primary mental abilities, measured by the Thurstone tests, and some form of college grades. In general, the multiple correlation coefficients range from .38 reported by Darley[3] to .640 reported by Ellison and Edgerton.[5] Goodman[7] has reviewed several of these studies and his conclusions appear to hold for most of the investigations in which primary mental abilities are used. Patent generalizations by Goodman are these:

1) The Thurstone Primary Abilities Tests correlated, on the whole, as well as most standardized intelligence tests with criteria of college success.

2) The Thurstone Primary Abilities Tests correlate with individual college courses to some degree and can be used for prediction of success in these courses.

3) Verbal Ability correlates higher than any other of the abilities with semester point averages and individual college courses.

4) Multiple correlations obtained by using various combinations of the Primary Abilities Tests yield some increase in correlation over those obtained by using single abilities, when correlated with semester grade point average.

The literature reporting study of mental abilities and high-school academic achievement is extremely limited. Three investigations have reported correlation coefficients. Holzinger and Swineford[8] investigated the relation of two bi-factors to achievement in geometry and other subjects. A multiple correlation coefficient of .768 is reported between a 'general mental factor' and 'spatial factor,' on the one hand, and American Council Coöperative Plane Geometry Test scores, on the other. Zero order coefficients given for marks in the subjects of plane geometry, English, biology, foreign language, chemistry, history, shop and crafts, and drawing range from .219 to .586 for the 'general mental factor' and from −.003 to .692 for the 'spatial factor.' [See also [9]]

In a project designed to study transfer of training, Wesman[11] administered a series of tests that measured achievement and

intelligence in much the same way and in the same general areas as the tests administered for the present study. The intelligence test was designed to measure verbal, numerical, and spatial abilities; and the achievement tests covered social studies, natural science, mathematics, literature, reading comprehension, contemporary affairs, and a foreign language. He obtained an average correlation of .485 between the test of verbal ability and the various measures of scholastic achievement. The average coefficient between number ability and the same measures is .350 and that for spatial ability is .285.

PROCEDURE

The general design for the present study called for the measurement of primary mental abilities and the measurement of academic achievement for a large sample of high-school students. After the scores were obtained they were analyzed statistically to determine, for the sample, the relationship between, (1) each primary mental ability and each achievement measure, (2) combinations of primary mental abilities and each achievement measure, and (3) predicted achievement scores and each primary mental ability. To this end zero order correlation coefficients, multiple correlation coefficients, and multiple regression coefficients were computed.

The subjects for this study were five hundred ninety-one entering ninth-grade students of two school systems in Iowa. These subjects comprised the entire ninth-grade student body in these two systems, except for absentees.

The tests administered were *The Chicago Tests of Primary Mental Abilities for Ages 11 to 17; the Iowa Tests of Educational Development, Form X-1;* the *Coöperative English Test C1; Reading Comprehension, (Lower Level) Form R,* and a reading test constructed by C. V. Burt for experimental purposes.

The *Iowa Tests of Educational Development* are designed to measure general achievement and growth in certain academic areas at any point from grade IX through XIII. They are not designed to measure specific course achievement or growth. The scores used for this investigation included those for: (1) Understanding of Basic Social Concepts; (2) General Background in the Natural Sciences; (3) Correctness in Writing; (4) Quantitative Thinking; (5) Reading—Social Studies; (6) Reading—Natural

Sciences; (7) Reading—Literature; (8) General Vocabulary, and (9) Composite of scores for tests 1 through 7. The *Coöperative English Test C1: Reading Comprehension* is designed to measure rate of comprehension and level of comprehension. The reading test constructed by Burt consists of an 1800-word reading selection on which rate of reading is measured in terms of time required for reading the entire article. *Learning is measured by* an untimed multiple choice test administered at the conclusion of the reading and without further reference to the test. Both this test and the Coöperative test yield measures of comprehension that are uncomplicated by rate of reading.

Zero order correlation coefficients were obtained by use of the Pearson product-moment formula. Multiple correlation coefficients, beta coefficients, and standard errors for the beta coefficients were computed by formulae reported by Dwyer.[4] The computing procedures used for the present study were designed by Bechtoldt[1] and are modifications of the Doolittle method of solving simultaneous equations.

RESULTS

Comparison of the mental ability scores obtained in the present study with the published norms revealed that the central tendencies for the sample studied do not differ markedly from expected mean and median scores. It was found that some of the distributions of primary mental ability raw scores were somewhat skewed, although the distributions of Number ability, Verbal-Meaning ability, Word-Fluency ability, and Reasoning ability scores tended to be symmetrical and bell-shaped. The Space ability and Memory ability distributions were definitely skewed and not so symmetrical as the other distributions.

The measures of central tendency were close, in general, to the norms derived from a sample of the same mean chronological age, fourteen years and six months, as the present sample. The means obtained for Number, 49.6; Verbal-Meaning, 56.3; Word-Fluency, 49.7; and Memory, 10.5, were especially so. The respective norms are: 47, 55, 48, and 10. The mean, 37.5 for Space ability was less than the norm, 44, and the mean, 29.2, for Reasoning ability was greater than the norm, 25, published with the tests. The obtained medians differed slightly from the corresponding means, which is an indication that the distribu-

tions were skewed. However, the same tendency found in the present sample seems to have existed in the original population from which the norms were obtained.

The relationship found between each primary mental ability and each achievement criterion is expressed as a product-moment correlation coefficient in Table 1. With but two exceptions,

TABLE 1.—CORRELATION COEFFICIENTS OBTAINED FROM THE SIX PRIMARY MENTAL ABILITIES AND THIRTEEN ACHIEVEMENT CRITERIA

Achievement	Primary Mental Abilities					
	V	R	N	W	S	M
Comprehension Speed	.729	.491	.320	.347	.286	.236
Comprehension Level	.669	.423	.257	.281	.259	.186
Reading Time	.404	.197	.269	.161	.061*	.120
Learning	.553	.256	.090*	.237	.273	.179
Social Studies	.658	.314	.156	.241	.333	.136
Science	.584	.304	.187	.200	.291	.116
Writing Correctness	.636	.562	.434	.419	.225	.287
Quantitative Thinking	.542	.464	.320	.295	.389	.239
Reading Soc. Studies	.675	.456	.365	.297	.257	.217
Reading Science	.636	.405	.322	.281	.260	.210
Reading Literature	.683	.421	.327	.290	.246	.196
Vocabulary	.781	.401	.247	.335	.288	.177
Composite ITED	.793	.501	.359	.355	.350	.238

* Not significant at the five per cent confidence level.

these coefficients are all significantly different from zero at the one per cent confidence level when the *t* test is applied.

The Comprehension Speed and Comprehension Level scores used for the correlations reported in Table 1 were obtained from the Coöperative English Test, the Reading Time and Learning scores were obtained from the Burt test, the Learning score being the number of correct responses on the untimed comprehension test. The remainder of the criterion scores listed in Table 1 were yielded by the *Iowa Tests of Educational Development.* The

Vocabulary achievement score was not used to form the composite score.

In the original computations the score for Reading Time represented the length of time taken to read completely the test passage once. The obtained coefficients were negative, since the slower the reader the greater the Reading Time score. However, if the Reading Time score represented words read per minute, which it does by one interpretation, the obtained coefficients would be positive. Since the interpretation of words per minute is more meaningful, the coefficients for Reading Time are reported here as being positive.

The coefficients in Table 1 have been arranged from left to right according to general magnitude for each primary mental ability. Thus, the coefficients for Verbal-Meaning ability are the greatest, in general, and those for Memory ability are the least. It may be observed that the correlations between Verbal-Meaning ability and the achievement measures used in the present study are relatively high. The range is from .404 to .793. The correlations between Reasoning ability and the achievement scores are substantial, ranging from .197 to .562. In general, the correlations between Number, Word-Fluency, Space, and Memory abilities and the present achievement measures tend to be low, or negligible. The only exceptions are the correlations between Writing Correctness and the primary mental abilities of Number and Word-Fluency. These r's are .434 and .419, respectively.

One would expect that combinations of primary mental abilities would correlate more highly with achievement scores than single primary mental ability scores. The results of this study are in accord with this expectation.

Cumulative multiple correlation coefficients obtained from combinations of primary mental abilities that include from one to all six are given in Table 2. This table shows how the multiple correlation coefficients increase as successive primary mental abilities are added to the correlated combination until all six primaries are included in the final combination. Each successive combination, reading from left to right, includes all of the preceding variables plus the one listed at the head of the column. Thus, Column R includes the variables V and R, Column N includes the variables V, R, and N, etc.

In Table 2 the coefficients under the heading V are of zero

order. The remaining columns in Table 2 contain multiple correlation coefficients and the coefficients in the Column under W were obtained by using all six primary mental ability scores. The coefficients in column W, then, are the highest coefficients it was possible to secure using the present data.

TABLE 2.—CUMULATIVE MULTIPLE CORRELATION COEFFICIENTS OBTAINED BY ADDING SUCCESSIVE PRIMARY MENTAL ABILITIES TO THE PREVIOUS COMBINATION

Achievement	Primary Mental Abilities					
	V	R	N	S	M	W
Comprehension Speed	.729	.752	.756	.756	.758	.758
Comprehension Level	.669	.683	.684	.685	.685	.688
Reading Time	.404	.404	.439	.444	.444	.448
Learning	.553	.553	.557	.569	.576	.576
Social Studies	.658	.658	.659	.674	.675	.678
Science	.584	.586	.586	.597	.597	.604
Writing Correctness	.636	.707	.732	.733	.737	.739
Quantitative Thinking	.542	.596	.606	.632	.638	.638
Reading Soc. Studies	.675	.696	.711	.712	.712	.715
Reading Science	.636	.650	.661	.663	.664	.667
Reading Literature	.683	.695	.705	.705	.705	.708
Vocabulary	.781	.783	.784	.785	.785	.786
Composite ITED	.794	.810	.821	.822	.822	.824

It may be observed that the R's, when all six variables are included, range from .448 to .824. Also, it may be observed that the coefficients from combinations of two and three variables are nearly the same as coefficients resulting from the combination of all six primary mental abilities.

Table 2 has indicated that not all of the six primaries contribute appreciably to the correlation when all six are used in combination. It was fundamental to the purposes of this study to learn which mental abilities do contribute appreciably, and significantly, to the relationship with achievement measures, and the relative part that each primary mental ability may play in

the total relationship of an optimum combination. Results satisfying these purposes are given in Table 3 in the form of beta coefficients. The beta coefficient is a statistic that tells the relative importance of the independent variables in terms of standard scores when a multiple regression equation is used to predict dependent variable standard scores. The beta coefficient

TABLE 3.—PRIMARY MENTAL ABILITY BETA COEFFICIENTS FOR EACH ACHIEVEMENT TEST

Achievement	Primary Mental Abilities					
	V	R	W	S	N	M
Comprehension Speed	.63	.16	−.03*	.03*	.08	.05*
Comprehension Level	.61	.13	−.06*	.03*	.05*	.03*
Reading Time	.41	−.02*	.07*	.07*	−.20	.00*
Learning	.53	−.02*	−.01*	−.13	−.08	.09
Social Studies	.65	−.01*	−.08	.16	−.01*	.02*
Science	.57	.01*	−.10	.13	.04*	.00*
Writing Correctness	.43	.27	.07	−.05*	.17	.07
Quantitative Thinking	.37	.16	−.02*	.20	.11	.09
Reading Soc. Studies	.59	.13	−.08	.02*	.17	.03*
Reading Science	.56	.09	−.07*	.05*	.14	.04*
Vocabulary	.75	.04*	−.04*	.05*	.03*	.01*
Composite ITED	.70	.11	−.07	.09	.13	.05*

* Not significant at the five per cent level.

is given for each primary mental ability when all six are used in multiple regression equations for the prediction of achievement scores. The standard errors for these coefficients vary from .03 to .04. Therefore, all values above .0784 are significant at the five per cent confidence level, and certain values larger than .0588 are also significant at this confidence level. In Table 3, those values which are not significant at the five per cent confidence level have been starred.

Table 4 presents for each criterion the optimum combination of primary mental abilities selected by using those variables having significant beta coefficients. Also given are the multiple

correlation coefficient for the optimum combination, the lower limit of the five per cent confidence interval for the true R, and the per cent of variance in the achievement test scores accounted for by the optimum combination. The lower limits of the five

TABLE 4.—OPTIMUM COMBINATIONS OF PRIMARY MENTAL ABILITIES, MULTIPLE CORRELATION COEFFICIENTS, FIDUCIAL LOWER LIMITS, AND PER CENTS OF ACHIEVEMENT VARIANCE ACCOUNTED FOR

Achievement	R	Lower Limit	Primary Mental Abilities Beta Coefficients					Var. Per Cent
			V	R	N			
Comp. Speed	.756	.670	.63	.18	.08			57
			V	R				
Comp. Level	.683	.570	.60	.15				47
			V	N	S			
Read. Time	.443	.270	.38	.18	−.07			19
			V	S	M	N		
Learning	.576	.430	.52	.13	.09	−.09		33
			V	S	W			
Soc. Studies	.678	.570	.65	.16	−.08			45
			V	S	W			
Science	.602	.470	.58	.14	−.09			36
			V	R	N	M	W	
Writing Correct.	.737	.640	.43	.28	.17	.07	.07	54
			V	R	N	S	M	
Quant. Thinking	.638	.500	.37	.16	.11	.21	.09	40
			V	R	N	W		
Reading Soc. St.	.712	.600	.57	.14	.16	−.09		50
			V	R	N			
Reading Science	.661	.540	.55	.11	.13			43
			V	R	N			
Reading Lit.	.705	.600	.60	.10	.13			49
			V	R				
Vocabulary	.783	.700	.75	.06				61
			V	R	N	S	W	
Composite ITED	.823	.680	.70	.11	.13	.09	−.07	68

per cent interval for the true R's have been obtained from charts especially prepared by Ezekiel.[6] These true R's are free from sampling error and represent the relationships for the population from which the present sample can be considered a random sample. Table 4 also shows the per cent of variance in achievement test scores that is accounted for by the optimum combi-

nation of primary mental abilities. These per cents range from 19 for Reading Time to 68 for the Composite scores on the *Iowa Tests of Educational Development.*

Probably the outstanding feature of Table 4 is the variation in the make-up of the optimum combinations. The number of abilities varies from two to five. It is apparent that the same mental abilities do not appear in all combinations, and only one primary appears in all combinations. That one is Verbal-Meaning ability. Reasoning ability and Number ability appear in nine of thirteen combinations, while Space, Word-Fluency, and Memory appear, respectively, in six, five, and three combinations.

CONCLUSIONS

The data obtained in the present study appear to support the following conclusions:

1) Verbal-Meaning ability is highly related to every high-school achievement measure used in the present investigation. This primary mental ability makes a significant contribution, and accounts for a considerable share of the prediction of every achievement score.

2) Reasoning ability stands in moderately high relationship with several of the measures of achievement used in this investigation, but is clearly a poor second.

3) Number ability tends to have little relationship to the achievement scores used in this investigation.

4) Word-Fluency ability, Space ability, and Memory ability have little relationship to the present measures of achievement.

5) Combinations of selected primary mental abilities were found to be highly related to the achievement scores. However, not all of the six mental abilities studied in this investigaton contributed significantly to the relationships obtained between combinations of primary mental abilities and measures of school achievement.

6) Optimum combinations of primary mental abilities account for a considerable part of the variance found in criterion achievement scores. The range found in the present study varied from approximately one-fifth to two-thirds of the total variance in the achievement scores.

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BOOK REVIEWS

B. F. SKINNER. *Walden Two.* New York: The Macmillan Co., 1948, pp. 266.

The author of this new utopia is B. F. Skinner, now professor of psychology at Harvard University. Dr. Skinner is known to the general public as the inventor of the mechanical baby-tender, an air-conditioned box with a glass front. It was used for Skinner's second child. Other people have now copied the idea. The mother is freed from much of the care of the child during its early years. The child in the box is pretty much isolated from germs and outside stimulation. In some ways this sets the pace for life in Walden Two. This ideal community, located in the Mid-west, is isolated from the world. People work only four hours per day and they do only the things they like to do, work or otherwise.

Skinner, a prominent American behavior psychologist, gained his professional reputation mainly through an extensive series of experiments on rats. This material, initially published in scientific journals, was brought together with a discussion of the theoretical implications in *Behavior of Organisms*—the Skinner system of behaviorism.

Of necessity, Walden Two is largely a psychological utopia run by behavioral engineers, i.e., psychologists. Perhaps the publishers are a trifle over-optimistic when they print on the book jacket: "Mr. Skinner has based it on good, solid psychological and economic theories applied to present-day American life. It is the kind of dream that can be translated into reality."

Professor Burris (a psychologist) arranges for two of his students, disillusioned war veterans, and his colleague, Dr. Castle (a philosopher), to accompany him to Walden Two which has been created by Frazier, one of Burris' former classmates. Several days are spent at Walden Two, which appears to be a prosperous coöperative enterprise. This utopia is explained by Frazier, while Professor Castle and his philosophy act as a ridiculous foil to Frazier's ideas. Marriage is in the early teens and child-bearing is usually over by age twenty-three. The children are taken from the parents at birth and reared in community nurseries, for home is not the place to raise children. According to Walden Two, the boys or girls will never in later life have the

same capacity for love as they have in their teens. But husband and wife live in separate rooms. This not only makes the individual happier and better adjusted, it tends to strengthen love and affection of husband and wife. And the intelligent wife sees at once that it is better for the happiness of the family if someone else does all the house-work and cares for the children.

Triumph over another person is not approved, so no team games but tennis and chess are allowed. The competitive factor presumably is not involved here. Small pamphlets are prepared to develop approved behavior. Thus, if a person tends to be jealous, he's handed one of the pamphlets. He reads it and is immediately cured.

In Walden Two, no one is free but every person feels he is free because children are conditioned to like to do the approved things. The technique employed in training is positive reinforcement. By this alone a behavioral and cultural technology is built up. So the question of freedom never arises. It is seen, too, that the people want to do precisely the things which are best for themselves and the community. "Their behavior is determined, yet it is free."

Walden Two is run by a group of specialists. The government is a limited sort of despotism, but the despot must wield his power for the good of others. Religion is dispensed with. Instead, the priests (i.e., psychologists) conduct Sunday meetings—a sort of group therapy. And no history is taught, but children are taught that in America, pleasant and attractive people, interesting landscapes, and homes have never been available to many, except at the expense of poverty, disease and filth of many more. The aim at Walden Two is not only to develop the most alert and active group-intelligence (this term is ambiguous) that has appeared on earth, but to design personalities. "Give me the specifications, and I'll give you the man!"

The author works in an evaluation of Walden Two. "It's the crowning achievement in the history of the human intellect to date—" And again, in the person of Frazier who, having climbed up to the 'throne,' surveyed Walden Two through his glasses and having assumed the posture of the crucifixion, says; "Yes, I look upon my work and, behold, it is good." Also; "Perhaps I must yield to God in point of seniority . . . though I might claim that I made a more explicit statement of my plan."

Although so implied, Walden Two is far from a self-sufficient community. It can exist only as long as it is protected by the U.S.A. Surplus produce is sold outside Walden Two for script with which to buy materials from the outside. Doctors and graduate students are trained outside in the best medical and graduate schools. Loans of books from the outside are obtained and automobiles are purchased. Radio programs and recordings are brought in. Apparently, Walden Two would suffer culturally and technically without drawing continually from the outside world. In fact, Burris thinks enough of foreign exchange to go to the ticket office and get the refund on his train ticket before walking back to Walden Two.

The thread of the plot in *Walden Two* is tenuous. The book is not only uninteresting, but poorly written. *Walden Two* is rich in imagination and unique in viewpoint. Nevertheless life in Walden Two would be intolerable to a normal human being brought up in contemporary American culture. Few of those living in a democracy will accept or admire Skinner's schema of political science (democracy is the spawn of despotism) or wish to be governed by specialists, particularly by psychologists.

It is a long step from 'rat psychology' to either child psychology or to human social and political psychology. Many readers will question whether *Walden Two* is based upon sound psychological principles. In fact, the careful reader will wonder whether the author of *Walden Two* is serious, or whether he is writing with his tongue in his cheek.

Why do people write utopias? There may be, of course, a variety of motives. Probably no two such authors have the same motive. Undoubtedly the personality and life experiences of the author are important. There can be a sincere wish to better the lot of mankind, or there can be personal frustrations that are resolved as in reverie, a way of escape from the complexities and inhibitions of contemporary life. Possibly it could be merely intellectual exercise, an expression of ego, or something else. The author of any utopia may not clearly know the motive himself. In any case, an attempt at this time to demonstrate that behavior psychology has reached the stage where positive reinforcement or any other established psychological technique can solve all the dilemmas of life in a social situation will fail, as it does in *Walden Two*. Any ideal existence dreamed

up by a single specialist (i.e., a political scientist, an economist, a psychologist, etc.) is bound to give a one-sided emphasis that is intolerable and not even remotely workable.

In any case, *Walden Two* is provocative. Few readers will reach the end of the book without rather violent reactions, questions and marginal notes of opposition.

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HERBERT SORENSON AND MARGUERITE MALM. *Psychology for Living.* New York: McGraw-Hill, 1948, pp. 637.

"Today many adults have personality problems and mental maladjustments that make them unhappy and make life for those around them less pleasant than it might be. . . If adults need such help, high-school students need it even more." (page. V.) In *Psychology for Living* the authors attempt to interpret some of the major findings of psychology for high-school pupils. These findings are then applied to a wide range of high-school problems. The scope of these problems is indicated by the six major sections of the book: (1) Your Behavior and Its Foundations; (2) Your Feelings, Emotions, Desires, and Habits; (3) Your Mental Health and Adjustment; (4) Your Growth and Learning; (5) Your Intelligence and Thinking; and (6) Your Courtship, Marriage, and Lifework.

Authors who attempt to 'write down' a technical subject face such difficult problems as the number of topics to be discussed, the choice of appropriate vocabulary, and the interpretation of ideas presented. For example, if a wide range of topics is presented, the treatment of many of these topics will tend to be quite generalized. This is true, especially in the discussion of many of the one hundred seventy-five or more technical psychological terms developed largely in the first half of the text. The more extensive and explicit application of psychology to such problems as study habits, straight thinking, and good heterosexual relationships in the latter half of the book is much more satisfactory.

The choice of psychological terms is on the whole fairly standard. Some discrepancies apparently exist, however, between certain technical definitions given in the glossaries and their textual interpretations. Furthermore, the introduction of the psycho-

analytic concepts of 'complex,' 'repression' and 'the unconscious' is perhaps unfortunate. The term 'complex' is used rather loosely at several points long before it is explicitly treated; 'repression' appears to include the concept of conscious inhibition; and 'the unconscious' is left entirely unexplained. The real explanatory value of each of these concepts may, of course, be questioned.

Several questions may likewise be raised about the implication of some of the ideas developed in this text. Can we literally get rid of undesirable emotions? Are the defense mechanisms of rationalization, projection, and negativism unreservedly bad? Is conflict to be avoided as a bad thing? Is having enough time to study the most important aspect of study? There are strong implications in the text that the authors' position on each of their points is 'yes.'

Noteworthy features of the organization of the book include stimulating introductory and concluding questions to each chapter, previews to each major part of the book, a glossary of technical terms, and separate reading lists for teachers and pupils. Illustrations are plentiful and are relevant to the text in the majority of cases. The authors' style is commendable, being lively, readable, and containing many concrete illustrations and examples.

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Harvard Becker and Reuben Hill, Editors. *Family, Marriage, and Parenthood*, Boston: D. C. Heath and Co., 1948, pp. 829.

This book, a symposium written by twenty-four authors, is an outgrowth of an earlier symposium, *Marriage and the Family*, edited by the same authors. It is written (1) for the serious student of sociology and (2) for the college student interested in family matters.

Part I treats the subject historically. Ancient practices, practices in various cultures, past and present, the origins of present-day practices, and American family life today are featured in Part I, presumably as background material.

The five remaining parts deal with the more practical aspects of the subject although here the book exhibits a commendable

sensitiveness to tested knowledge. One may learn about marriageable personalities, where the sex organs are located and how they function, birth control, love and courtship; gain information about length of engagements, trial marriages, making a go of marriage, sources of discord, financing and managing the family, caring for the mother before and after, designing the home, religion in the home, what the members should know about law, divorce, meeting crises in family life, the prospects for future family life, and many other matters related to family, marriage, and parenthood.

The book contains a wealth of knowledge that is readily assimilable. It should be well received.

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Ernest Gardner. *Fundamentals of Neurology.* Philadelphia: W. B. Saunders Co., 1947, pp. 336.

What are the basic concepts of neurology which can best serve as a foundation for more specific studies? The content of *Fundamentals of Neurology* represents Dr. Gardner's answer to this question. The material, selected by him in the light of this frame of reference, he has presented in twenty chapters including such topics as the central nervous system, peripheral nervous system, blood supply and cerebrospinal fluid, formation and development of nervous system, microscopic anatomy, properties of the reflex, structures mediating reception and response, cerebral cortex, cerebellum, general senses, special senses, visceral activity, brain stem and cerebellum, spinal cord, and the forebrain, motor and sensory functions of the cerebral cortex. The final chapter treats the associative functions of the cerebral cortex. Names in neurology—including a listing and brief description of important contributors—are a special feature included at the end of most chapters. Also included after each chapter is a short, selective list of references and summary. The appendix includes a glossary of terms and an index. It is intended to serve as a foundation for zoological and psychological studies and as a text for nurses, physiotherapists, and occupational therapists. The book is very well put together, well organized, and is printed on surprisingly good paper for post-war years. No attempt is made to treat everything comprehensively.

The emphasis is as functional as can be made in an elementary text. The contributions from gross and microscopic studies, experimental studies, as well as clinical methods are all relatively well selected and considered.

The last chapter is more distinctly on a psychological level of description. The chapter starts with this sentence: "Mental and emotional events or processes form what may be termed the psychological level of the organism, that is to say the 'mind'. Although one cannot consider the mind as substance, there is no doubt that it is resident in the nervous system." Later on in the same chapter he again makes a similar reference. That this would not be a satisfactory description of the psychological organism as a whole to many psychologists, there is no denying. But for the purposes that the book is intended to serve, this is not a great error and the fundamental concepts which they should have is given here. Psychiatry, in his glossary, is defined as "literally meaning mind-healing, it is really the science of behavior, including behavior disorders." And psychology is defined as "the science which treats of mental and behavioral processes." The book ends with a quotation from Max Eastman's *The Will To Live.* The last two sentences quoted from Eastman are: "Any rubber ball can react, but it requires life to act. And life does act. It seeks experience." References for this chapter, aside from this literary licensed one, include: Lashley, Hilgard, Marquis, McGeogh, P. T. Young. Since the philosophical aspects of the implications of the subject are not elaborated on, the book as a whole can serve the purpose which the author intended. A very satisfactory elementary text giving the foundations which can serve for basis for further learning, is this book on the *Fundamentals of Neurology.*

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